

Research Department Report *on the* Paper Manufacturing Industry



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Research Department Report

on the

Paper Manufacturing Industry

Extent and Distribution of Market—

There are more than 500 paper manufacturers in the United States but probably not more than 200 of them are extensive users of lumber for packing boxes, frames or crates. The estimated annual lumber requirements of these companies based largely upon individual reports is, in round figures, 140,000,000 feet of lumber grouped according to states as follows:

Connecticut.....	2,664,000 feet
Delaware.....	480,000
District of Columbia.....	200,000
Indiana.....	935,000
Maine.....	15,800,000
Maryland.....	6,000,000
Massachusetts.....	32,385,000
Michigan.....	14,760,000
New Hampshire.....	2,650,000
New Jersey.....	4,005,000
New York.....	10,830,000
Ohio.....	14,160,000
Pennsylvania.....	22,520,000
Vermont.....	500,000
Wisconsin.....	14,447,000

TOTAL.....142,336,000 feet

Classification of Products—

Paper mill products may be divided into three general classes with reference to the method of packing for shipment.

(1) PAPERS REQUIRING WOOD BOXES OR FRAMES.

This class represents approximately twenty-five per cent of the total paper tonnage of the country.

From ninety to ninety-five per cent of the lumber used in packing paper products is used for packing the papers included in this class. No form of paper package is suitable and these products must be shipped in wooden

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boxes or frames, even when shipped by the carload. The demand for lumber for this purpose is affected only by the demand for these paper products.

This class includes:

Writing papers, such as bonds, linens, ledgers, flat writing, fine correspondence, French folio, onion skin, etc.

Book papers in sheets, such as fine machine finish, sized and super calendered, English finish, antique, plated, coated, lithograph, offset, etc.

Fine cover papers.

Fine cardboards and any boards that are coated or highly finished, such as coated blanks, etc.

Enameled blotting.

Special papers, such as drawing paper, gummed paper, lining paper, etc.

- (2) PAPERS THAT ARE EITHER SHIPPED IN LIGHT WOODEN BOXES OR CRATES, OR IN CORRUGATED OR FIBRE CONTAINERS.

This class represents approximately five per cent of the total paper tonnage.

A number of manufacturers of this class of products still use lumber, but the present tendency is in favor of the paper container.

This class includes:

Tissues and tissue paper products.

Crepe papers and crepe paper products.

Special papers and paper products that are light in weight, including manifold papers and writing paper in boxes and envelopes.

- (3) PAPERS USUALLY SHIPPED IN BUNDLES OR IN ROLLS WITHOUT OTHER PROTECTION THAN A WRAPPING OF HEAVY PAPER.

This class represents approximately seventy per cent of the total paper tonnage.

This class includes:

News print in sheets or rolls.

Magazine paper and special papers that are printed from the roll.

Common cover papers.

Common Boards, including strawboard, pulp board, news board, corrugated board, binders' board, trunk board, press board, leather board, etc.

Manila writing paper.

Plain blotting paper.

Hanging or wall papers.

Paper bags and coarse paper products.

Wrapping paper, building paper, roofing paper, etc.

All paper products require wooden boxes for export shipments.

Construction of Cases—Cases for heavy papers are usually made of one inch boards of various widths, and reinforced with end cleats of the same thickness.

Typical shipping cases for book paper, bond, ledger, bristol and cardboard are:

25½"x38½"x13½"	to hold	5	reams	25x38—100	lb. Coated Book Paper.
22½"x34½"x24"	"	"	20	" 17x22—28	lb. Bond Paper.
28½"x34½"x24"	"	"	24	" 17x28—25½	lb. Ledger Paper.
22½"x28½"x26"	"	"	4	" 22x28—140	lb. Bristol Board
25½"x30½"x24"	"	"	4	" 25x30—140	lb. Cardboard.

Packages of all the heavier kinds of papers are well standardized at from 500 pounds to 600 pounds in weight and approximately the same package weight applies to all weights of paper. For instance, a standard package of 100 pound paper will consist of 5 reams and of 50 pound paper of 10 reams. If the paper weighs 80 pounds to the ream, however, a ream will not be broken and the package will weigh 480 pounds or 560 pounds.

Consequently the varying weights of the sheets may account for as light variation in the height of the package for one grade of paper.

Cases for tissues, envelopes and light paper products are usually made of ¾" ends and cleats and ½" sides, tops and bottoms.

As a rule all kinds of papers that are shipped in wooden cases are well packed and reach their destination in good condition. Paper distributors, however, don't fail to notice the packages that are especially good. Several distributors for instance, who distribute S. D. Warren & Co.'s papers along with a great variety of other papers, refer to the Warren cases as always good or as the best of any they receive. Distributors like to get good cases so they can make use of them for repacking to ship to their customers. The Warren people say that they once tried out a wire bound case and considered it quite satisfactory, but returned to the established case on account of the protests of their distributors, who didn't find them satisfactory for their reshipping purposes.

Construction of Frames—Small shipments that can be made without casing, are wrapped in heavy paper, protected at top and bottom by wooden frames and tied with twine. Wooden frames used in place of cases are of two types, the skeleton frame made of 1x2 to 3 inch strips with narrower cross pieces—and the solid frame consisting of a solid platform of thin boards with a reinforcement similar to the skeleton frame. The skeleton frame is more extensively used than the solid frame but the use of either



Typical Shipping Cases used by S. D. Warren & Co., Boston, Mass. Each of these cases contains 5 reams 32 x 40—119 lb. Book Paper. Basic weight 25 x 38—80 lbs. per ream.

type on shipments of a size to warrant the use of cases is limited. A considerable amount of twine is required to make a package that will stand rough handling. Only about a third as much paper can be packed this way as in a standard case. Since there must be a frame on the top as well as on the bottom of the package, that means six frames as compared to one shipping case, and the saving in lumber is small.

Construction of Export Cases—The chief difference between domestic and export shipping cases is that the latter are well strapped with metal straps. Some companies use a better grade of lumber for export cases or select for the purpose the best boards from the grade purchased for domestic cases.

Why Paper Manufacturers Buy Lumber, Not Shooks—Paper products of the first class, which require most of the lumber used for packing, are produced in such a great number of sizes, weights and bulks that it is practically impossible to use a standardized case or box shook. A single company oftentimes uses more than one hundred different sizes of boxes in shipping their paper.

The width and length of the shipping case are determined by the size of the sheet of paper. Large sheets are packed in cases of the proper width and length to fit a single sheet and smaller sheets in cases to fit two sheets, packed side by side. On account of the weight a very close fit is required in order to avoid shifting and damage to the paper, consequently, special cases are made for each size of sheet, however slight the variation in size. In book papers this means eleven different widths and lengths of cases for the regular sizes, and in ledger papers fourteen different widths and lengths for regular sizes. Special sizes greatly exceed in number the regular sizes.

See page 8 for list of standard sizes.

The height of the shipping case is determined by the weight and bulk of the paper.

Sheets of the same size are produced in varying weights. For example, coated book paper 25x38 is produced in eight different weights which necessitate eight different heights of cases of the same width and length. This variation in height applies in a greater or less degree to the cases for all the standard sizes of papers of all classes.

See page 9 for list of standard basic weights.

The other factor that determines the height of case is bulk. The different classes of paper of the same weight may vary enough in bulk to make a considerable difference in the height of the case. For instance, two of the several different classes of book paper made by S. D. Warren & Company bulk as follows:



Typical frames used by some manufacturers for shipping cheaper grades of Book Paper. These packages are wrapped in strong paper, protected top and bottom with frames and tied with strong twine. Note that three of these packages bulk about the same as one of the shipping cases shown on page 4.

Library Text (English Finish) 50 pounds to the ream, bulks 350 sheets to the inch.

Old Style (Antique Book) 50 pounds to the ream, bulks 233 sheets to the inch.

One bond or writing paper will be more bulky than another of the same weight and the same thing applies to cover papers and other products.

Papers that show enough difference in bulk to affect the height of the case may be classified broadly as soft, medium and hard. Most mills make papers of all three descriptions, consequently, the variation in the heights of cases to accommodate different bulks is approximately three times as great as the weights indicate. Due to these two factors, namely, weight and bulk, a variety of no less than five different heights is required for cases that are uniform in their other dimensions.

Kinds of Lumber Used—Seventeen different kinds of wood are reported used for packing cases—eight soft woods and nine hardwoods. The hardwoods are used chiefly in Wisconsin. The majority of manufacturers are using soft woods such as White Pine, Western Soft Pine, Spruce, Western Red Cedar, Hemlock, Yellow Pine and Douglas Fir.

Comparative price usually determines the class of material that will be used although some of the larger companies are using better lumber than formerly and are making contracts for their requirements with dependable manufacturers.

The grades and kinds of lumber the Weyerhaeuser Sales Company have sold to paper manufacturers are listed below and give a very clear idea of the desirability of this business from the mill's viewpoint.

1x4 & Wider	6 to 20'	#4	Northern Pine
"	"	#5	Northern Pine
"	"	#4	Idaho White Pine
"	"	#5	Idaho White & Western Pine
"	"	#4	Western Soft Pine
"	"	#4	Fir & Larch
"	"	#4	Western Red Cedar
"	"	#3	& Better Common White Fir (Specified widths)
"	"	#4	Common White Fir
"	"	#2	Common Douglas Fir
"	"	#2	Southern Pine
"	"	#3	Southern Pine

Paper manufacturers like a light wood for their cases in order to keep down the shipping weight. As a matter of fact, however, the differences in weight between the several soft woods commonly used are comparatively small.

Standard Paper Sizes

Book papers are made in a very wide range of regular sizes, the most common of which are as follows:

24x36	28x42	33x46	42x56
25x38	28x44	36x48	44x64
26x29	32x44	38x50	

Flat writing papers with few exceptions are made in three single sizes and three double sizes as follows:

Single	Double
17x22	22x34
19x24	24x38
17x28	28x34

Most bond and linen papers are made in the same sizes as flat writing papers.

Most fine correspondence papers are 21x33.

The ordinary sizes of ledger papers are as follows:

Single	Double Short Way	Double Long Way
16x21	21x32	16x42
17x22	22x34	
17x28	28x34	
18x23	23x36	18x46
19x24	24x38	19x48
20x28		

Cover papers are made in two common sizes, viz: 20x25 and 22x28, with many slight variations in either or both dimensions. Some are made in double sizes.

Cardboards, with the exception of a few special boards, are made in one size only, viz: 22x28, with a few slight variations.

Street Car Blanks, Record Bristols, etc., are made in such sizes as:

20x25	22x34
21x33	24x36

Standard blotting papers are 19x24, with the exception of inter-leaving blotting paper which is 18x23.

SPECIAL SIZES

Practically all papers are made in special sizes to order. It is common practice among printers, publishers and manufacturers of blank books, loose leaf forms, etc., to order a special size for any job that requires a con-

siderable amount of paper and that does not cut exactly out of a standard size, since by so doing they can avoid waste.

While these special sizes apply to any kind of paper or cardboard that the printer uses they are more common in book papers than in any other kind. To supply the demand, some book paper mills make it a practice to cut to order any special length from rolls of a given width, and practically all of the mills accept willingly orders for both special lengths and special widths. Some of the larger mills will have orders on their books for as many as fifty special sizes at one time.

Standard Paper Weights

The ordinary basic weights per ream, applying to all sizes in which the paper is made, are as follows:

Book Papers.

Coated	25x38	60#	70#	75#	80#	90#	100#	110#	120#
English Finish	25x38	50#	60#	70#	80#	100#			
Sized and Super Cal- endered	25x38	50#	60#	70#	80#				
Machine Finish	25x38	50#	60#	70#	80#				
Antique	25x38	50#	60#	70#	80#				
Offset	25x38	60#	80#	100#	120#	150#			
Cover Papers	20x25	32#	48#	65#	80#	130#			

Writing Papers.

Flat	17x22	16#	20#	24#	28#	
Bond	17x22	13#	16#	20#	24#	28#
Ledger	17x22	20#	24#	28#	32#	36#
Fine correspondence	21x33	60#	70#	80#	100#	

Cardboards.

22x28 100# 120# 140#

Papers are usually designated by weights; for example, a "100 pound" coated book paper means that a ream of 500 sheets 25x38 weighs 100 pounds. Even if the sheets are of a special size or of some other standard size making the ream weigh more or less than 100 pounds the stock is commonly referred to as "100 pound" paper, indicating that it is of the same thickness as the standard. The sizes and weights tabulated are the standards by which other sizes are judged.



Typical shipping cases for Bond and Ledger Papers. These cases contain Hammermill Bond. Size 22 x 34. Made by the Hammermill Paper Co., Erie, Pa.

Common Terms Relating to Paper and Paper Making

Animal Sized—Sized with gelatin.

Antique Paper—A light, bulky paper with a soft dull surface, uncalendered, and as a rule containing no loading; used largely for novels and other books, and for catalogs that have no half-tone illustrations.

Bible Paper—A strong, thin opaque paper used originally for bibles, now largely for dictionaries, and other books that are designed to take up small space.

Beater—A large cylinder with knives across its surface revolving in a vat where the washed rags are beaten into fine pulp.

Binders' Board—A hard polished cardboard used for the base of stiff book covers, etc.

Blank—A common white cardboard of low grade wood pulp.

Coated Blank—A plain blank to which is added on one side or both sides a coating of clay and size to give it a smooth printing surface.

Pasted Blank—A plain blank to which is pasted thin paper to give it a smooth surface.

Plain Blank—A blank with natural surface.

White Blank—A coated blank, white in color.

Bogus—Used to indicate various products of an inferior grade.

Bogus Bristol—Imitation bristol board made of low grade wood pulp.

Bogus Manila—Imitation manila paper.

Bogus Wrapper—A coarse brittle wrapping paper made from refuse material.

Bond Paper—Paper made of long fibre writing paper stock so as to obtain strength. Originally made exclusively of white rags. Wood pulp is now used largely in the cheaper grades.

Box Board—Cheap cardboard made from mechanical wood pulp, waste paper, hemp, etc. It is used largely for box making.

Box Paper—Paper of the same characteristics as cover paper but made in very thin sheets so as to paste down easily in covering boxes.

Bristol Board—High grade cardboard, first made in Bristol, England.

Bulk—The relative thickness of sheets of paper.

Calendering—Producing a smooth finish on paper by passing it between polished rolls or calenders.

Cap (or Flat Cap)—A size of ledger or writing paper 14x17 inches

Cardboard—A general term applied to any thick, stiff paper, either made originally in a single sheet or by pasting two or more thin sheets together.

Coated—A general term applied to book papers, cardboards and cover papers which are surfaced on one side or both sides with an adhesive mixture of a mineral substance such as clay and glue, which is rolled to a smooth surface.

Coated Blotting—Blotting to which a sheet of coated paper is pasted to obtain a smooth printing surface.

Cover—A general term applied to any paper designed for covering pamphlets usually made thicker and stronger than book paper and in colors.

Cylinder Dried—Same as machine dried.

Cylinder Machine—A paper making machine in which the pulp is carried from the vat on the surface of a large wire cylinder instead of a constantly moving horizontal wire screen as used on a Fourdrinier machine.

Dandy Roll—A light wire cylinder attached to paper making machines which impresses upon the paper its pattern. The wires are made in two forms, one with a closely woven mesh which produces "wove" paper: the other with parallel wires laid close together intersected by other wires at right angles, spaced about an inch apart, producing a pattern that is termed "laid."

Deckle Edged Paper—Paper from which the rough edges formed by the deckle strap have not been removed.

Deckle or Deckle Strap—A flexible rubber strap on a paper making machine to limit the width of the web.

Demy—A size of ledger or writing paper 16x21 inches.

Double Demy—(wide)—A sheet 21x32 inches.

Double Demy (long) — A sheet 16x42 inches.

Double Cap—A sheet 17x28 inches.

Double Double Cap — A sheet 28x34 inches.

Dull Coated—Coated paper with a dull instead of a shiny surface, obtained by less calendering in the process of manufacture or by adding to the finished coated,

glossy surface a thin size which is calendered just enough to make the surface smooth without giving it a polish.

Double Folio—A sheet twice the size of folio: 22x34 inches.

Double Double Folio— A sheet four times the size of folio: 34x44 inches.

Duplex—Paper that is one color on one side and a different color on the other, applied chiefly to cardboards and cover papers. Obtained on a coating machine by using a different mixture for each side or on a paper machine by passing through heavy rolls two sheets of different color while yet wet, thus causing them to adhere, forming a single sheet.

Enamel—A term sometimes used in place of coated.

Engine Sized—Paper that is sized by adding resin size to the pulp in the beating engine. Sometimes abbreviated E. S.

Envelope Paper — Any writing paper made to a size from which envelopes will cut to advantage.

Filler—A substance such as clay added to paper pulp to fill up the pores and thus produce a smoother surface when rolled or calendered. Filling is sometimes called loading for the reason that the added substance increases the weight in addition to filling the pores.

Flat Paper—Paper which comes from the mill in flat sheets without fold or crease.

Flat Writing—A term applied to common writing paper as distinguished from bond paper.

Folio—A size of paper 17x22 inches, applied chiefly to bonds, flat writing, and ledgers.

Fourdrinier—A paper making machine named for the inventor, and

differing essentially from the cylinder machine in that it uses a horizontal wire screen for carrying the pulp from the vat in place of the wire cylinder used on the cylinder machine.

French Folio—A very thin paper similar to bond paper, used for second sheets, manifolding, etc. It is similar to onion skin, but does not have as high a finish.

Glazed Paper — Paper with a smooth, shiny polish; applied chiefly to label paper, which is glazed on one side only.

Gummed Paper — Paper coated with common gum or other adhesive material.

Halftone Paper—Paper with a coated surface for printing halftones. Generally referred to as "coated."

Index Bristol—Bristol made of practically the same stock as is used in making bond paper.

India Paper — (a) Thin, strong, yellowish printing paper, made by hand in China and Japan from vegetable fiber, and used largely for printing fine steel engravings. (b) Machine made paper resembling somewhat the original India paper. Thin, tough, and opaque. Used for bibles, dictionaries and other thin editions. Similar to bible paper.

Jordan Engine—A refining engine, conical in shape, lined on the interior with knives, provided also with a core covered with knives on the outside and revolving on a shaft.

Kid Finish—A dull finish given to correspondence paper and Bristol board, and sometimes to high grade book and cover papers.

Kraft—Brown paper made of soda wood pulp of high quality, having considerable strength, named from

the German word "kraft", meaning strength.

Laid Paper—Paper made on a laid dandy roll. When held up to the light it shows a pattern consisting of parallel lines close together in one direction, and intersected at right angles by other parallel lines about an inch apart. Applied chiefly to antique book paper, flat writing paper, and linen writing paper.

Ledger Paper—Writing paper made of high grade rags which give it great strength, tub sized and rolled to give a smooth writing surface; distinguished from bond paper chiefly by its smoother surface and the greater thicknesses in which it is made.

Linen Paper—Any paper made entirely or partly of linen fibres. Applied chiefly to fine writing papers.

Linen Bond—Descriptive term applied to some high grade bond paper.

Linen Ledger—Descriptive term applied to most high grade ledger papers.

Lithographic—A soft sized, coated paper made especially for the lithographic process. Applied also to cardboard with a similar surface. For many purposes it is coated one side only. Usually abbreviated "Litho."

Loading—Any substance such as china clay employed to fill the pores and thus produce a smoother surface. This material naturally adds to the weight, hence the term. Sometimes called "filler."

Loft Dried—Paper dried by being hung up on poles in a drying shed or loft, and finished by natural process of evaporation of the moisture.

Machine Dried—Paper dried by

iron or steel drying cylinders heated by steam. The cylinders are from 3 to 4 feet in diameter and arranged in stacks. The steam heat is sometimes supplemented by the action of fans.

Machine Finish—Any paper glazed and calendered by a calender which is a part of the paper machine. Usually abbreviated "M. F." The term sized and calendered, abbreviated S. & C. which was formerly used to describe this grade of paper is now practically obsolete.

Magazine Paper—Various grades of book paper made especially for magazine use—usually in rolls.

Manifold Paper—Copying paper.

Manila Paper—Originally made entirely of manila hemp. The term is now loosely applied to many papers made of chemical wood pulp and refers to the buff color rather than to the substance of which the paper is composed. The term used by itself generally refers to wrapping paper.

Manila Writing—The same as railroad manila, generally applied to the better grades of this paper.

Mechanical Wood Pulp—Pulp prepared by grinding wood against stones in water, so-called as the process is purely mechanical as distinguished from chemical processes of making pulp.

Medium—A size of ledger or writing paper 18x23 inches.

Middles—Common cardboard prepared from waste paper or mechanical wood pulp and used as a base or core to which thin sheets of finished paper are pasted.

News—Common printing paper made from a mixture of mechanical and chemical wood pulp, containing usually 70% of me-

chanical. It is machine finished but is a lower grade of paper than that sold as machine finished or M. F. Sometimes called "news-print."

Offset Paper—Paper with a dull surface made for offset printing, a process that transfers the impression to a rubber blanket and from this to the sheet of paper.

Onion Skin—Light weight paper used for second sheets, manifold, etc. It is highly glazed, and its surface resembles somewhat the skin of an onion, hence its name. Similar to French Folio, but has a more highly polished surface.

Papeterie—Originally an ornamental box or case for writing materials, now applied commonly to fine grades of correspondence papers folded and packed with envelopes in a box.

Papeterie Papers—Fine correspondence papers made especially to sell in boxes.

Papier Mache—Material made of ordinary pulp mixed with china clay, rosin, etc., and molded by steel dies into a variety of forms, such as pails, tubs, etc.

Paraffin Paper—A grease proof and airtight paper made by mixing paraffin wax with the pulp.

Parchment—(a) Calf, sheep or goat skin, especially prepared for writing purposes. (b) Applied sometimes to writing, bond or ledger papers which somewhat resemble real parchment.

Pasteboard—Common board made by covering "middles" with thin sheets of paper called pastings.

Photo Mount—A thick cardboard made by pasting colored sheets of paper on a middle made of good cardboard stock.

Plate Paper—Paper especially designed for printing steel plate engravings.

Plate Glazed — Paper glazed in sheets by being placed between zinc or copper plates which are then passed through steel rolls under great pressure.

Poster Paper—Common printing paper made the same as news, but usually of somewhat better quality and frequently colored.

Pulp Board—A thick coarse cardboard made of mechanical pulp used for making boxes, etc.

Railroad Manila—A very cheap grade of writing paper of buff or yellowish color, so-called because used extensively for railroad forms.

Ream—A package of paper consisting of 500 sheets, formerly 480 sheets.

Ream Wrapped — Wrapped 500 sheets to the package before put into the shipping cases. Most writing papers are ream wrapped. Book papers are as a rule not ream wrapped.

Size—A solution of gelatin substances such as glue, starch or rosin used to glaze the surface of paper.

Soda Pulp—Pulp prepared by digesting wood with caustic soda.

Soft Paper—Unsize book or newspaper.

Strawboard—Box and packing board made of straw pulp which has received very little chemical treatment.

Sulphate Wood Pulp—Pulp prepared by digesting wood with a mixture of sulphate of soda, caustic soda and sulphite of soda.

Super Calendered—Paper, either printing or writing, which has been glazed in the super-calender, or "Super." When applied to book paper, the term sized is used

in connection with super-calendered and thus referred to as sized and super calendered, or S. & S. C. Machine finished paper is sized and calendered to a certain extent on the paper making machine while super calendered paper is in addition to this process run through another machine called the super calender.

Super Fine—Extra quality, applied chiefly to writing papers.

Super Glazed—Paper with extra finish.

Super Royal—A size of ledger paper 20x28 inches.

Tissue—A term applied to any very thin paper.

Tub Sized—Paper which is sized on the surface after it has been cut into sheets by dipping into a vat or tub of animal size. The other process of sizing is to mix the size in with the pulp in the beating engine and is called engine sizing.

Typewriter Paper — Bond paper made especially for use on the typewriter. Usually a thin bond.

Vellum—(a) Calfskin prepared for writing purposes.

(b) A thick writing paper with a surface and general appearance which somewhat resembles vellum.

Water Marked—Paper containing a pattern or lettering impressed into the sheet by a raised plate on the dandy roll.

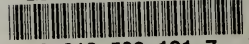
Wedding—Writing paper or cardboard of high grade made especially for wedding invitations, engraved announcements, etc.

Wove Paper—Paper made with a woven wire dandy roll. The meshes are so fine that their imprint is scarcely perceptible on the finished sheet of paper, in contrast to the heavier imprint made by the laid dandy roll.



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